

# EcoHouse: Material Efficiency and Digital Control with Rhino and VisualARQ

EcoHouse is a compact residential project located near Campeche Beach in Florianópolis, Brazil. Designed by architects Affonso Orciuoli and Marcelo Leal, the project explores how computational tools can support sustainable construction through material control, efficiency, and a rethinking of domestic space.

The house was conceived with a clear objective: to minimize environmental impact, both in terms of landscape intervention and material use. Except for the reinforced concrete foundations, the entire structure is built from autoclave-treated pine, with plasterboard walls and aluminum-framed openings fitted with mosquito screens to promote natural cross-ventilation.



*The house is conceived as a minimal footprint intervention, prioritizing open ground and a continuous relationship between built space and garden.*

Rather than maximizing built area, the design prioritizes open space. The program is condensed into a small footprint, allowing most of the plot to remain as a tropical garden. Inside, the living room, kitchen, dining area, and home office are organized as a single continuous space, opening onto a balcony and deck that blur the boundary between interior and exterior. The absence of doors in key areas reinforces this spatial continuity, creating an ambiguous condition where inside and outside coexist.

## **DIGITAL WORKFLOW: FROM 2D LAYOUT TO FULLY CONTROLLED 3D MODEL**

Rhino was used from the very beginning of the project. Initial stages focused on 2D layout development, defining spatial organization and relationships. Once the distribution was established, the entire project transitioned into a fully developed 3D model.

This shift was fundamental, as the digital model became the central tool not only for design but also for construction. All documentation, drawings, and coordination were generated directly from the model.

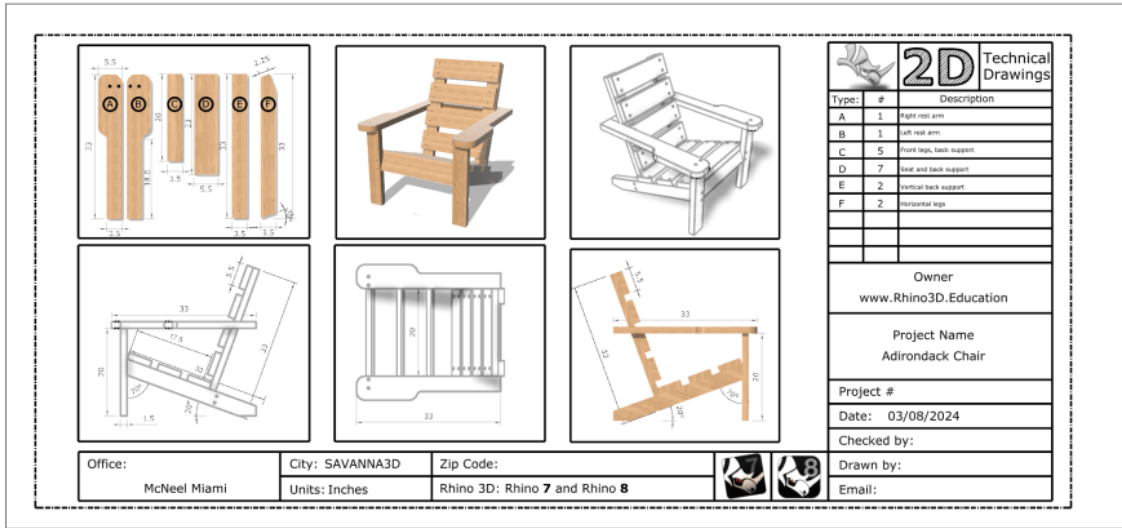


*A covered deck extends the interior program outward, blurring the boundary between inside and outside through material continuity and open spatial transitions.*

## **VISUALARQ & MATERIAL INTELLIGENCE**

[VisualARQ](#) played a critical role in the project, particularly in managing material control and construction logic.

Using VisualARQ, the team generated precise material schedules, especially for the timber components. These lists directly informed procurement and fabrication, ensuring that only the necessary amount of material was used. This approach significantly reduced waste and aligned with the project's sustainability goals.



## [See Also](#)

[2D TECHNICAL DRAFTING WITH RHINO](#)

The impact of this workflow extended beyond planning. The construction process was described as a “3D puzzle,” with each element pre-defined and precisely assembled on site. This level of control enabled the house to be completed in just two months by a team of three.



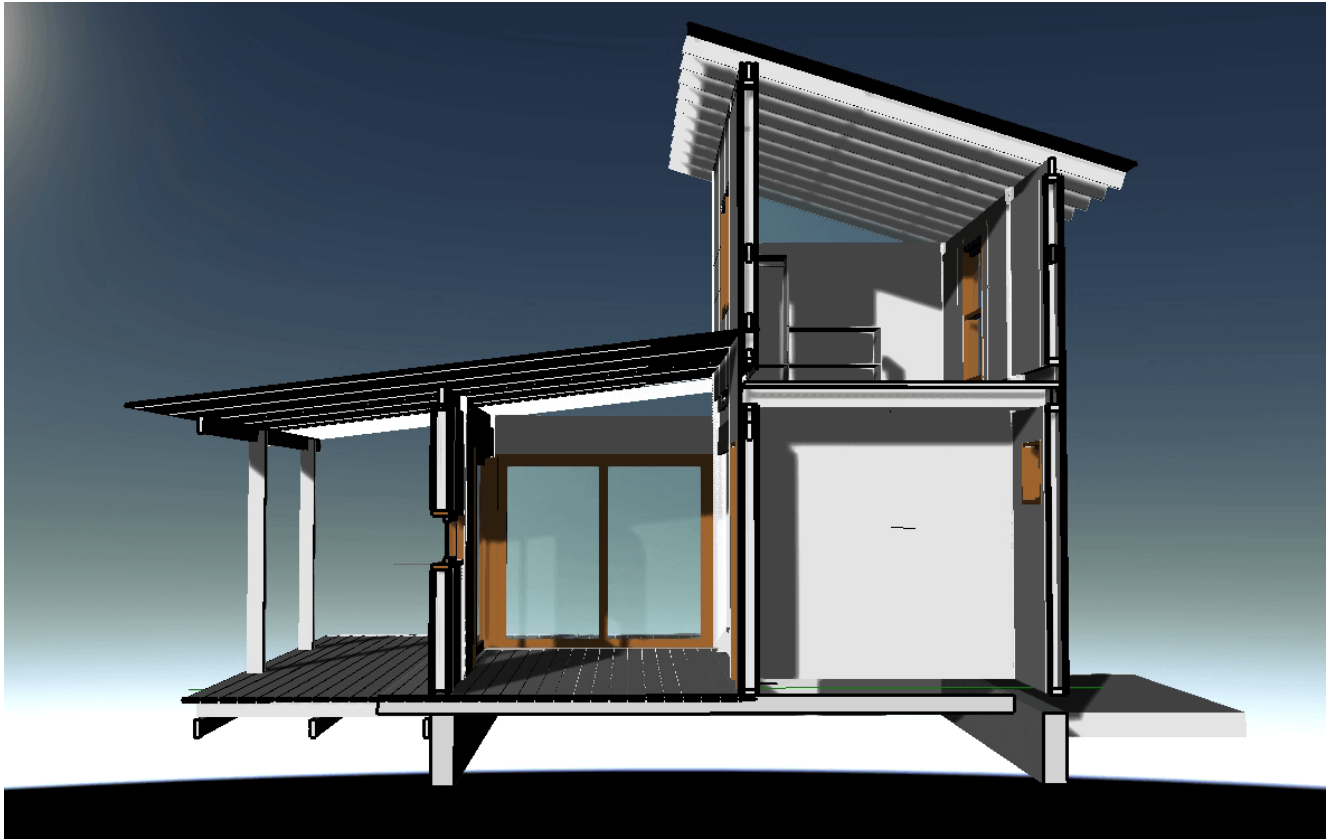
*The main living area combines kitchen, dining, and workspace in a single open plan, designed to maximize spatial efficiency within a compact footprint.*

## **DESIGN DECISIONS DRIVEN BY THE MODEL**

The digital model directly influenced several key design and construction decisions.

One of the most significant strategies was designing the house based on the dimensions of OSB panels. By aligning the design with standard material sizes, the team minimized cutting waste and optimized fabrication efficiency.

Another example is the metal staircase, which was fully developed in Rhino. The 3D model enabled accurate fabrication by the metal workshop, allowing the staircase to arrive on site ready to be installed, fitting perfectly within the predefined space.

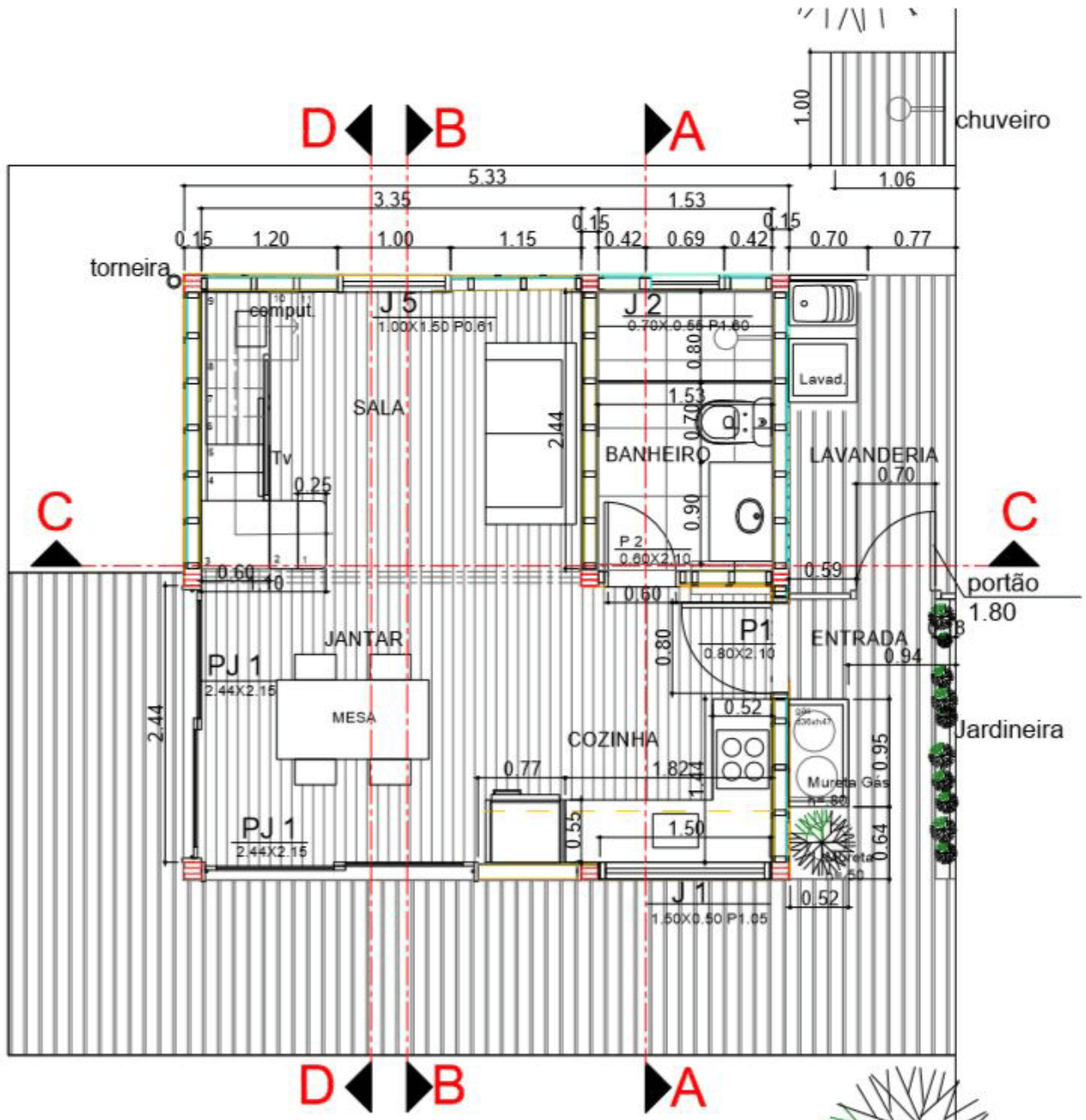


*3D model developed in Rhino, used to define structural relationships and coordinate the construction system.*

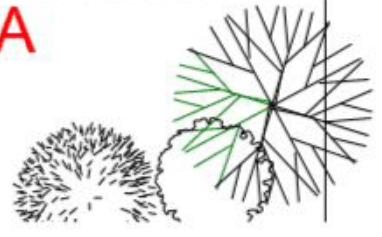
## **SUSTAINABLE STRATEGIES**

In addition to material efficiency, the project integrates environmental strategies at multiple levels.

To address local flooding issues, the ground was not sealed with concrete. Instead, a 40 cm layer of construction debris was introduced beneath the surface, creating a permeable “mattress” that absorbs rainwater and allows natural drainage. This system supports the natural water cycle and responds to the high water table of the site.



PLANTA BAIXA



*Floor plan generated from the digital model, where spatial layout and construction logic are directly linked to material quantification.*

The house also features a green roof and extensive vegetation. From above, the building blends into the landscape as a continuous green surface, minimizing its visual impact.

# RETHINKING DOMESTIC SPACE

EcoHouse challenges conventional residential design by reducing built footprint and emphasizing adaptability. The house is conceived as a system that can grow over time, allowing future expansions using the same logic of material reuse and efficiency.

At its core, the project demonstrates how digital tools like Rhino and VisualARQ can extend beyond representation to become active agents in construction, sustainability, and decision-making.



*EcoHouse in Florianópolis, Brazil, designed as a compact timber structure that integrates with its surrounding tropical landscape.*

## CREDITS

**Architects:** Affonso Orciuoli, Marcelo Leal

**Project Team:** Sonia de Mira

**Landscape Design:** Sonia de Mira

**Construction:** Oca Construções

**Metalwork (Staircase):** Serralheria Elo

**Metal Frames:** Orbital

**Green Roof:** Teto Vivo

**Garden Assembly:** JMA Jardinagem, Sonia de Mira

**Photography:** Lise Longo